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Internal structure of vortices in a dipolar spinor Bose-Einstein condensate[1] MAGNUS O. BORGH, University of East Anglia, JUSTIN LOVEGROVE, JANNE RUOSTEKOSKI, University of Southampton — We demonstrate how dipolar interactions (DI) can have pronounced effects on the structure of vortices in atomic spinor Bose-Einstein condensates and illustrate generic physical principles that apply across dipolar spinor systems. We then find and analyze the cores of singular non-Abelian vortices in a spin-3 ^{52}Cr condensate. Using a simpler spin-1 model system, we analyze the underlying dipolar physics and show how a dipolar healing length interacts with the hierarchy of healing lengths of the contact interaction and leads to simple criteria for the core structure: vortex core size is restricted to the shorter spin-dependent healing length when the interactions both favor the ground-state spin condition, but can conversely be enlarged by DI when interactions compete. We further demonstrate manifestations of spin-ordering induced by the DI anisotropy, including DI-dependent angular momentum of nonsingular vortices, as a result of competition with adaptation to rotation, and potentially observable internal vortex-core spin textures.

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